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Heat and salt content changes in the Adriatic Sea in response to observed variations of the thermohaline circulation in the Eastern Mediterranean

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During the past 20 years, important changes have been observed in the Eastern Mediterranean. The most important concerns the transient event related to the dense water production that shifted from the Adriatic into the Aegean Sea between 1987 and 1995 [1]. This event has been largely attributed to an increase of salinity and to anomalies in the air-sea heat and freshwater fluxes occurring in the Aegean Sea at the beginning of the 90's [2]. Basin-wide hydrographic observations conducted in the Eastern Mediterranean during the last decade (1995-2002) attest the status and the evolution of the major transient event showing a dumping of the deep Aegean outflow [3] and the presence of an additional source of highly saline and warm intermediate water that flows from the Cretan Sea (Southern Aegean) into the Ionian Sea, propagating prevalently into the Adriatic Sea [4]. Moreover, the presence of transitional layer (i.e. between the intermediate and the deep layers), mostly occupied by the old deep water, makes more separated the upper and the deep circulations, inhibiting the vertical mixing and favouring the spreading of the Levantine Intermediate Water.

Concurrently, several elements of variability have been observed occurring in the Adriatic Sea, such as (1) large interannual variations of the surface buoyancy fluxes, denoting net heat gain in some years like in 1994 [5], (2) the presence of highly saline intermediate water in the Southern Adriatic Sea that could have restarted the ventilation of the Adriatic Deep Water in 2002 [6]; (3) the formation of dense waters in the northern shelf that have been proved important for the periodically ventilation of the

deep layers in the middle Adriatic depression at one- to three-year intervals [7].

Here we report on results from an enlarged oceanographic database compiled for the Adriatic Sea analysing temperature and salinity data to detect variations mostly related to the changes of the general circulation in the Eastern Mediterranean. From the vertical distribution of water properties and regional analyses of the heat and salt content in the Adriatic Sea we conclude that the observed increases of temperature and salinity in the Adriatic Sea are caused both by atmospheric conditions and by large intrusions of salty waters trough the Otranto Strait. Property sections in the deep layer demonstrate the change in the vertical structure caused by the addition of the warmer, saline and recent ventilated Northen Adriatic Dense Water in the central region and able to reach the southern Adriatic as a density current along the western slope. Heat and salt content changes in the Southern Adriatic Sea are related to changes in thermohaline circulation of the Eastern Mediterranean. Fields of buoyancy content changes expressed as density anomalies are determined from the database and a coherent picture emerges

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